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A GENERAL RESUME OF THE LICHEN FLORA OF INDIA

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Our knowledge of Indian lichens is quite inadequate, and far behind that of the European countries. Very little exploration for collection of lichens have been so far carried out in India. Compared to the large size of the country the area covered by the lichen collection localities is very meagre. These areas are mostly in Manipur, Assam, Arunachal Pradesh, Darjeeling district, Sikkim, Botanic Garden, Calcutta, 24 Parganas of West Bengal, specific localities in Kumaun, Himachal Pradesh, Kashmir, the Nilgiri and Palni hills, the western Ghats, the Andaman Islands, and certain areas in Nepal and Sri Lanka (Ceylon). The rest of the areas in this vast subcontinent, possessing diverse phytogeographic regions, has been hardly touched even by a stray lichen collector. Even in many of the earlier mentioned localities, collections have been made rather cursorily, often by non-lichenologists, so that they need to be explored over again by competent lichenologists for proper collections. In the 19th century botanists like Wallich, Belanger, Hocker and Thomson, Strachey & Winterbottom, Kurz, Watt, Thwaites, Luthi, Levier and others, collected lichens which were noticeable, along with other plants. Awasthi and his associates started in the mid-twentieth century extensive and intensive collections of lichens. Others who have gathered lichens are plant collectors accompanying the Japanese expeditionists to Nepal Himalayas, J. Poelt (Munich) from Nepal, Ajay Singh from Andamans, Hale and Patwardhan from Western Ghats. Large collections have also been made by K. P. Singh from Manipur, and by Ray-Chowdhury from 24 Parganas of West Bengal. However, even if all these collections were pooled together, it would probably not touch the 50,000 specimens mark—a number much low for a proper understanding of the lichen flora of the subcontinent. Further, most of these collections are located at widely different places, making it difficult for study, comparison and consolidation of the information. In addition, since the types of almost all the species described during the 19th century are preserved in the different European herbaria, even the authentication of the recent collections has become a formidable task.

In a Catalogue of lichens from India, Nepal, Pakistan and Ceylon, Awasthi (1965) gave a detailed historical account up to the year 1965, of the different collectors and collections, and their publications. Details of the different taxa numbering to over 1300 species under 158 genera have also been included. This will be useful for those pursuing their lichenological activities in India. Studies on Indian lichens in India and abroad from 1965 the pace of lichenological studies has quickened. Over 300 species have been added to the lichens already known from the Indian subcontinent.

Within the last 12 years, majority of the contributions to the lichens of India have been made at the Department of Botany, Lucknow University by Awasthi and his associates. Short notes on the species of *Alectoria, Heterodermia,* lichens from Pindari Glacier valley, monographic accounts on the genera *Dirinaria* and *Parmelia* have been published by Awasthi (1970, 1973, 1975 a, 1975 b, 1976). Several papers dealing with the lichens of Darjeeling district were published by Awasthi and Agarwal (1968 a, 1968 b, 1969, 1970). These were followed by works on lichens of Kashmir, Palni and Nilgiri hills, additions to the lichen flora of India by Awasthi & K. P. Singh (1970, 1971, 1972 a, 1972 b, 1972 c, 1973 a, 1973 b, 1975 a, 1975 b). Certain interesting lichens from Meghalaya and Panchmarhi were later published by Awasthi and S. R. Singh (1977 a, 1977 b), and an enumeration of the lichens from Mussoorie hills was made by Awasthi and Joshi (1977). More recently an account of the lichen genus *Leptogium* (sect. Mallotium) from India was described in detail by Awasthi and Akhtar (1977). An enumeration of the lichens from Nilgiri hills was published by Singh and Singh (1976), while some new additions to the lichens of India was made by K. P. Singh (1973) also.

There are three other centres of lichenological studies in India. Mention may be made here of a short note on the Graphidaceous litchens by Dharne and Roy Chowdhury (1968) at the Botanical Survey of India, Calcutta. Certain foliicolous lichens, particularly *Porina, Strigula, Raciborskiella* from Andaman Islands were described by A. Singh (1970 a, 1970 b, 1971) working at the National Botanical Research Institute, Lucknow. More recently some activity on the lichens has been initiated at the Maharashtra Association for Cultivation of Science, Poona, where Patwardhan and his associates (Patwardhan and Kulkarni, 1977, Patwardhan and Prabhu, 1977) have published short notes on Thelotremataceae and Graphidaceae.

Interest on Indian lichens has been shown by a few foreign lichenologists as well. Asahina and Kurokawa (1966), and Kurokawa (1967, 1974) from Japan treated certain taxa of *Cladonia* and *Parmelia* from E. Himalayas and Nepal. While publishing the monographic work on the genus *Parmelia* Hale (1965, 1972, 1977), and Hale and Kurokawa (1964), and Hale and Patwardhan (1974) described some new species from India, and also included the Indian taxa in the monographic treatments. In the monographic treatment of the genus *Collema,* Degelius (1974) has reported 22 species of the genus occurring in India and Nepal. A rather thorough collection of lichens from Nepal was made by Poelt (Munchen, Germany) in 1962. These have very systematically been worked out by several specialists, and the up to date publications based on that collection and on some borrowed specimens are : genus *Cladonia* by Abbayes (1974), genus *Alectoria* by Bystrek (1969), genus *Lasallia* by Frey (1977), saxicolous *Lecidea* by Hertel (1977), genus *Baeomyces* by Jahns and Seeden (1974), genus *Stereocaulon* by Lamb (1967), genus *Leptogium* (sect. Mallotium) by Mitchell (1974), genera *Lecanora, Ochrolechia, Physcia, Physciopsis, Physconia, Umbilicaria, Dermatocarpon, Ioplaca* by Poelt (1966 a, 1966 b, 1974, 1977 a, 1977 b, 1977 c, 1977 d), *Chaenotheca* and *Coniocybe* genera by Schimdt (1974) and the genera *Dimerella* and *Pachyphiale* by Vezda and Poelt (1974). All these have been published in Khumbu Himal.

Out of the species known so far from Indian subcontinent, about 50% belong to the crustose forms, most of which have not been collected a second time. A great majority of these are corticolous Pyrenocarpus, Graphidaceous and Thelotremataceous lichens which are widely distributed in the tropical and temperate regions of the country, some of which exhibit a wide distribution and others are almost endemic. Distributionally, the lichen flora shows strong correlation with the climatic conditions and arboreal elements of the flora of the regions. The tree trunks of the evergreen tropical forests are often plastered with interesting crustose lichens belonging to the three groups mentioned above. Foliicolous lichens are also quite common on the upper side of the evergreen leaves of shrubs, and lower branches of trees where moisture and shade is available. But no exhaustive collections have been made except those mentioned by Awasthi and K. P. Singh (1972 a, 1972 c) from Palni and Nilgiri hills and some taxa from Andaman islands by A. Singh (1970 a, 1970 b). The deciduous tropical and subtropical forests have comparatively a poor lichen growth in rather dry regions, but at moist situations foliose lichens such as species of *Dirinaria, Pyxine, Physcia, Heterodermia, Parmelia* and *Leptogium* are found associated with the crustose taxa of the families Cryptotheciaceae, Lecideaceae, Lecanoraceae and Buelliaceae.

The temperate climate offers the optimum conditions for rich and luxuriant growth of lichens in variety and development. Such areas have been the chief centres of lichen collections in the Himalayan region and the hills in the peninsular India. The foliose and fruticose forms predominate in these regions and generally comprise of the genera of *Parmelia, Heterodermia, Physcia, Peltigera, Sticta, Lobaria, Collema, Leptogium, Dermatocarpon, Cladonia, Umbilicaria, Stereocaulon, Ramalina* and *Usnea.* The crustose forms occur on rocks and also on the bark of trees and sometime on the ground. These lichens belong to the families Pyrenulaceae, Graphidaceae, Lecideaceae and Lecanoraceae. Some members of these crustose forms have either endolithic or endophloedal development of the thallus, so that their presence becomes apparent only when their fruit bodies have been formed as they are developed on the surface of the substrate.

The lichen flora in the upper temperate region and the alpine region of the Himalayas often shows a continuity with the adjoining temperate region at the generic level. But often the species differ. The chief genera occurring are *Lobaria, Parmelia, Cetraria, Xanthoria, Umibilicaria, Cladonia, Stereocaulon* of the macro-lichens, and *Lecidea, Rhizocarpon, Lecanora, Caloplaca, Rinodina* and *Buellia* of the micro-lichens, growing on rocks, twigs of shrubs, soil, and decaying vegetable debris. In still higher altitudes the lichens are mostly terricolous or saxicolous belonging to the genera *Cetraria, Stereocaulon, Rhizocarpon, Caloplaca, Lecidea* and *Lecanora.*

With the present state of our knowledge of Indian lichens, it is premature to discuss their distributional pattern and affinities. Some indications of affinities can be made on the basis of the available information. The eastern Himalayan lichens have the Sino-Japanese and South-east Asian elements in their lichen flora, and which appears to be in consonance with the affinities of the higher plants. This relationship is exhibited by the species of the genera, *Sticta, Umbilicaria, Parmelia, Cetraria, Alectoria, Ramalina* and *Usnea.* The western Himalayan lichens particularly certain species of the genera *Dermatocarpon, Lobaria, Solorina, Parmelia, Xanthoria, Physcia* show affinity with the European lichens. Further several taxa, e.g. *Stereocaulon piluliferum, S. macrocephalum, Cetraria ambigua, C. thomsonii, Ramalina himalayensis, Physcia melanotricha,* *P. pyrrhophora, Usnea pectinata, U. thomsonii* and several other species are endemic.

A fourth type includes species that are almost cosmopolitan pantropical or temperate circumpolar, e.g. *Dermatocarpon miniatum, Lobaria pulmonaria, Peltigera canina Baeomyces roseus, Xanthoria elegans, Cladonia rangiferina, Lecanora rubina, Cetraria islandica, Alectoria jubata, Thamnolia vermicularis, Rinodina mniaraea, Parmelia cirrhata, Physcia hispidula, Heterodermia boryi* etc.

The crustose lichen generally, appear to be widely distributed.

Details of the oceanic elements of the lichens are not available for India. A single species—*Roccella montagnei*—is of wide distribution along the eastern coast from Orissa to Kerala.

Certain lichens have a disjunct distribution. viz. *Pecania hoegii* (subsimilar to *P. coralloides*), *Glypholecia scabra, Lecanora peltata,* & *L. maculata* which occur in the dry western Himalayas, Central Asia and Rocky mountains of America and in Peru; *Leptogium resupinans* in Shillong, Bolivia and Canary islands; *Leptogium burgesii* in S. Indian hills and S. America; *Haematomma leprarioides* in Darjeeling and Brazil. There are few other examples of this category.

The commonest foliose and fruticose lichens are : *Parmelia cirrhata, P. nepalensis, P. nilgherrensis, P. tinctorum, P. meizospora, Leptogium burnetiae, L. pedicellatum, Collema pulcellum, C. subnigrescens, Lobaria retigera, L. isidiosa, Heterodermia diademata, H. pseodospeciosa, H. boryi, Physcia hispida, Peltigera canina, Dirinaria consimilis, D. applanata, Pyxine sorediata, Dermatocarpon vellereum, Usnea flexilis, U. pectinata, U. dichotoma, U. subsordia, U. thomsonii, Ramalina subcomplanata, Cladonia foliolosa, Stereocaulon piluliferum, Roccella montagnei.* etc.

With the promise held out by the Botanical Survey of India, it is hoped that it would be possible for an exhaustive and intensive collection of lichens from near and far flung regions of the country. With such a programme of large collections and subsequent detailed study we shall have a LICHEN FLORA OF INDIA in print within a reasonable time.

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